

REMARKS

This response is intended as a complete response to the Final Office Action dated October 12, 2007. In view of the following discussion, the Applicants believe that all claims are in allowable form.

FINALITY OF REJECTION

The Applicants respectfully submit this Office Action should not be Final. The Examiner states that the Applicants' amendment necessitated the new grounds of rejection. However, the Applicants did not amend the claims in the prior Response. Accordingly, the present new grounds of rejection are not necessitated by Applicants' amendment, but rather by Applicants' persuasive argument regarding the prior grounds of rejection. As such, the Applicants submit that the Finality of this response should be withdrawn.

CLAIM REJECTIONS

A. 35 USC §103 Claims 1-2, 4-8, 17-19, 21-22, 26-30, 38, and 42

Claims 1-2, 4-8, 17-19, 21-22, 26-30, 38, and 42 stand rejected under 35 USC §103(a) as being unpatentable over United States Patent 6,774,045, issued August 10, 2004 to *Liu, et al.* (hereinafter *Liu*) in view of United States Patent 6,204,203, issued March 20, 2001 to *Narwankar, et al.* (hereinafter *Narwankar*). The Applicants respectfully disagree.

Independent claims 1 and 21 recite limitations not taught or suggested by any combination of the cited art. *Liu* discloses a method for reducing halogen gases and byproducts in post-etch applications. (*Liu*, Abstract.) Specifically, *Liu* discloses the use of a high temperature (up to about 300 degrees Celsius) ashing process using O₂/N₂ for a short time, or at lower temperatures for a longer period of time. (*Id.*, Summary of Invention; claim 5.) The process is solely disclosed as used in post polysilicon etch applications. (*Id.*, col. 2, ll. 34-39.)

As the Examiner admits, *Liu* fails to disclose heating the etched substrate to a temperature of at least 50°C in a non-plasma gas mixture comprising oxygen and nitrogen, as recited in claims 1 and 21. (Final Office Action, p. 3, ll. 14-15.)

However, the Examiner cites *Narwankar* to assert a teaching of heating a substrate at a temperature 400-650°C in a non-plasma gas mixture comprising oxygen and nitrogen in order to remove carbon from the surface of the substrate. (*Id.* at 16-18, citing *Narwankar*, col. 7-8) The Examiner further contends that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify *Liu* in view of *Narwankar* because the teachings of *Nawankar* will remove carbon from the surface of the substrate. (*Id.* at 18-21.) The Applicants respectfully disagree.

Nawankar teaches a method of forming a metal oxide dielectric film. (*Narwankar*, Abstract.) At the location cited by the Examiner, and elsewhere, *Narwankar* teaches subjecting a metal oxide film to an intermediate temperature anneal process at a temperature between 400-650°C using a non-plasma gas mixture comprising N₂ and O₂ to remove carbon from a metal oxide/silicon nitride interface. (*Id.*, col. 7, ll. 26-62; Figure 1.) For example, *Narwankar* teaches to deposit an amorphous tantalum oxide film (or other metal oxide film) by thermal chemical vapor deposition using a metal organic precursor. (*Id.*, col. 6, ll. 19-28.) *Narwankar* further teaches that, due to the use of metal organic precursors, carbon (in the form of atomic carbon and carbon-hydrogen molecules) are incorporated into the deposited film and that excess carbon in the metal oxide dielectric is thought to lead to high leakage currents. (*Id.*, col. 6, ll. 45-54.)

However, *Narwankar* fails to teach or suggest subjecting an etched polysilicon layer (the workpiece of *Liu*) to such a process. In addition, *Liu* fails to teach or suggest that carbon is undesirably present on the polysilicon being treated to remove the halogen residues. Thus, the process to remove carbon from the metal oxide/silicon nitride interface of *Narwankar* is inapplicable to the post polysilicon etch halogen residue removal process of *Liu*. As such, contrary to the Examiner's contention, it would not have been obvious to one skilled in the art at the time the invention was made to combine the teachings of *Narwankar* with that of *Liu*.

As such, the combination of *Liu* and *Narwankar* fails to teach or suggest a method for removing a halogen-containing residue including heating the

substrate to a temperature of at least 50°C in a non-plasma gas mixture comprising oxygen and nitrogen as recited in independent claims 1 and 21. Therefore, a *prima facie* case of obviousness has not been established as the cited art is not combinable in a manner that yields the limitations recited in the claims.

Thus, claims 1-2, 4-8, 17-19, 21-22, 26-30, 38 and 42 are patentable over *Liu* in view of *Narwankar*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

B. 35 USC §103 Claims 3, 11-12, 23, 35-37, and 39-41

Claims 3, 11-12, 23, 35-37, and 39-41 stand rejected under 35 USC §103(a) as being unpatentable over *Liu* and *Narwankar* and as applied to claims 1-2, 4-8, 17-19, 21-22, 26-30, 38, and 42 and further in view of United States Patent 5,545,289, issued August 13, 1996 to *Chen, et al.* (hereinafter *Chen*). The Applicants respectfully disagree.

Independent claims 1 and 21 recite limitations not taught or suggested by any permissible combination of the cited art. The patentability of claims 1 and 21 over *Liu* and *Narwankar* has been discussed above. *Chen* is cited to show a microwave plasma source and various process conditions. However, *Chen* fails to teach or suggest heating an etched substrate to a temperature of at least 50°C in a non-plasma gas mixture comprising oxygen and nitrogen, and exposing the heated substrate to a plasma that removes the halogen-containing residue, as recited in claims 1 and 21. As such, any combination of *Chen* with the teachings of *Liu* and *Narwankar* would still fail to yield a process that would result in the limitations recited in independent claims 1 and 21. Therefore, a *prima facie* case of obviousness has not been established as the combination of the cited references fails to yield the limitations recited in the claims.

Thus, claims 3, 11-12, 23, 35-37, and 39-41 are patentable over *Liu* and *Narwankar* as applied to claims 1-2, 4-8, 17-19, 21-22, 26-30, 38, and 42 and further in view of *Chen*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

C. 35 USC §103 Claim 25

Claim 25 stands rejected under 35 USC §103(a) as being unpatentable over *Liu* and *Narwankar* and as applied to claims 1-2, 4-8, 17-19, 21-22, 26-30, 38, and 42 and further in view of United States Patent 6,133,102, issued October 17, 2000 to *Wu* (hereinafter *Wu*). The Applicants respectfully disagree.

Independent claim 21, from which the above-rejected claim depends, recites limitations not taught or suggested by any permissible combination of the prior art. The patentability of claim 21 over *Liu* and *Narwankar* has been discussed above. *Wu* is cited to show etching a polysilicon layer using a halogen gas in addition to hydrogen gas. However, *Wu* fails to teach or suggest a modification of the teachings of *Liu* and *Narwankar* in a manner that would yield ...heating the substrate to a temperature of at least 50°C in a non-plasma gas mixture comprising oxygen and nitrogen, and exposing the heated substrate to a plasma that removes the halogen-containing residue, as recited in claim 21. Therefore, a *prima facie* case of obviousness has not been established as the combination of the cited references fails to yield the limitations recited in the claim.

Thus, claim 25 is patentable over *Liu* and *Narwankar* and as applied to claims 1-2, 4-8, 17-19, 21-22, 26-30, 38, and 42 and further in view of *Wu*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claim allowed.

ALLOWABLE SUBJECT MATTER

The Applicants thank the Examiner for his comments regarding the allowability of claims 9, 13-16, 20, and 31 if rewritten in independent form including all of the imitations of the base claim and any intervening claims. The Applicants further thank the Examiner for his comments regarding the allowance of claims 43-50.

However, in view of the above discussion, the Applicants believe that all claims are presently in condition for allowance. Accordingly, the Applicants respectfully request allowance of all claims in the application.

CONCLUSION

Thus, the Applicants submit that all claims now pending are in condition for allowance. Accordingly, both further consideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that any unresolved issues still exist, it is requested that the Examiner telephone Alan Taboada at (732) 935-7100 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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